U.S. NAVAL BASE, PEARL HARBOR, NAVAL AMMUNITION DEPOT, MAGAZINE FOR EXPLOSIVES D
(U.S. Naval Base, Pearl Harbor, Fleet Industrial & Supply Center [FISC])
(Facility 425)
Pearl Harbor
Honolulu County
Hawaii

HABS No. HI-542

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN BUILDINGS SURVEY
U.S. Department of the Interior
National Park Service
Oakland, California

HISTORIC AMERICAN BUILDINGS SURVEY

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Location: Kuahua Avenue
Pearl Harbor
City and County of Honolulu, Hawaii

USGS 7.5 minute series topographic map,
Pearl Harbor Quadrangle, 1999.
Universal Transverse Mercator (UTM) coordinates:
04.609460.2362250

Present Owner: United States Navy

Present Occupant: United States Navy

Present Use: Vacant

Significance: Facility 425 is significant as a part of the early development of Pearl Harbor Naval Base, and the expansion of the Naval Ammunition Depot at Kuahua Island before World War I. Facility 425 is also significant for its distinctive construction type, as an example of a typical above-ground high explosive magazine building constructed by the Navy in the early 20th century, before 1928.

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PART I. DESCRIPTION

Facility 425 is a single story building with a rectangular footprint measuring 30'-4" x 26'-2". The building is constructed of 8" thick hollow terra cotta tiles with a stucco finish. It has a wood framed gable roof with exposed rafters with clipped rafter tails covered with asbestos-cement shingles. The shingle are laid in a pattern, called at the time of Facility 425's construction (in 1917), the "French Method," which gives a diamond pattern to the shingles. The roof has two round metal ventilators, about 1'-6" in diameter. Each ventilator has a lightning rod. A twisted metal cable joins the ventilator lightning rods. The cable is secured at the ridge of the roof by supplementary pointed brass fasteners, each screwed to a wood block that straddles the ridge. This cable, which was originally grounded in the earth, is clipped off near the roof gable ends.

The building has a concrete slab floor that is elevated about 2'-11" above grade on concrete foundation walls. The building has one six-light metal frame pivot sash window with metal shutters on the northwest side. The doorway opening into the building is on the southeast side and has a pair of interior-mounted surface-sliding doors that are covered in metal. Each door has a fixed louver panel in its lower portion.

Along the front (southeast) side of the building the concrete slab floor is extended to a 6'-0" wide loading platform that runs along the entire side. This loading platform is supported about 2'-11" above grade (the same level as the building floor) by five transverse foundation walls. The loading platform is accessed by wooden stairs at its south end. At the rear (northwest) side is a shed-roofed lean-to of corrugated metal on a wood frame. This lean-to is about 8'-4" high where it attaches to the wall. It extends about 16'-6" along this side and projects about 6'-11" from the wall.

The interior of Facility 425 is one large open room. It has a ceiling of tongue and groove boards, walls finished with stucco, and a concrete floor covered with sheet rubber flooring. There are two 1'-4" square vent openings in the ceiling, located under the roof ventilators. These vent openings have grid-patterned metal grates with a japanned finish[1]. One of the grates has fallen to the floor. The north wall of the interior and the north portions of the east and west walls have mirror panels installed over horizontal wood boards. The mirrored portions are about 6' high, extending up from just above the floor.

PART II. HISTORICAL CONTEXT

For more information see HABS HI-60, U.S. Naval Base, Pearl Harbor & HABS HI-388, U.S. Naval Base, Pearl Harbor Warehouses.

Origins of the Naval Ammunition Depot (NAD) at Kuahua Island, Pearl Harbor

Any discussion of the creation of Pearl Harbor Naval Base and the Naval Ammunition Depot at Kuahua must begin with the Philippines. Although the United States considered the Philippines extraordinarily valuable territory from at least the end of the Spanish-American War, President Theodore Roosevelt understood that they must either be held and defended by supporting them with naval forces, or be given up. As they were positioned within the sphere of the powerful Japanese Navy, which put the navies of the world on notice with their 1905 defeat of the

[1] Japanned finish is a hard, glossy black varnish-like finish commonly used on metals. It was historically obtained by various combinations of shellac, linseed oil, turpentine, asphaltum, and rosin.

Russian fleet at Tsushima Strait, a United States force in the Philippines capable of dominating the Japanese would require a monumental expenditure and commitment. The Philippine-American War had been ongoing since 1899. An initial decision on naval bases for the Philippines was reached in 1904 when appropriations were made for an installation at Subic Bay. The inability of the United States to obtain Subic Bay property at prices authorized by the appropriation stalled the project.

Despite the fact that the United States had harbor rights and had been maneuvering to acquire land at Pearl Harbor, a naval base there would remain a second priority as long as the U.S. administration considered holding and defending the Philippines. Even in 1906 it was felt by some Navy officers that Pearl Harbor would not be the site of a naval base until at least 1918, if at all.[2] The 1907 Japanese-American war scare and the circumnavigation of the Great White Fleet[3] prompted action on the lingering question of Philippine naval bases and a closer examination of the logistics involved. After study it was determined that a base at Subic Bay would be vulnerable to land attack. This resulted in a scaled-back plan for the defense of the Philippines, with the defense of Manila primarily relying on a fortress at Corregidor. The relatively minor defenses that were settled on in the Philippines assured that the Unites States would abandon the Philippines in any war with Japan and also prompted renewed interest in a naval base at Pearl Harbor. In the end, it was the high cost of maintaining "naval control of the western Pacific" that resulted in Pearl Harbor becoming the preferred location for basing any large fleet in the Pacific.[4] The Philippines "would be provided with a minimum force to hold the shortest line of defense and would be expected to exact a heavy toll of the conquerors, but…the defenders must expect to be overwhelmed."[5] "The decision to make Pearl Harbor our main naval base in the Pacific constituted a strategic retreat, but, unfortunately, it could not be accompanied by a complete release from all responsibility for the Philippines."[6]

After years of indecision over the development of Pearl Harbor, a bill to fund the naval base was passed on May 13, 1908 by a Congress mystified by the inaction of the Navy in not recommending it during the previous decades that the United States had harbor rights. The base was slated to provide a defense for the United States west coast and to facilitate U.S. naval domination in the Pacific.

A shallow, twisting channel through the bar at the entrance to Pearl Harbor had been opened in 1903, but work on the harbor and approaches under the new appropriation began on March 1, 1909 with a $3.3m contract to the Hawaiian Dredging Company, completed in December 1911. The other high-priority item in the 1908 appropriation was a dry dock capable of berthing the Navy's largest warships. The Navy stressed that Pearl Harbor was to be fitted as a repair and supply station; besides the channel dredging and the dry dock, funds were provided for a machine shop, storehouses, and yard development.

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[2] Willis Edward Snowbarger, *The Development of Pearl Harbor*, dissertation for PhD of History, (Berkeley: University of California, 1950), 105.
[3] Between December 1907 and February 1909 a United States fleet of 16 battleships and their escorts circumnavigated the globe under order of President Theodore Roosevelt as a show of naval power and ability. The ships' hulls were painted white and the armada came to be known as the Great White Fleet.
[4] Snowbarger, *Development of Pearl Harbor*, 109.
[5] Ibid.
[6] Ibid., 114.

Among the lesser projects also funded in the 1908 appropriation were magazines on Kuahua Island, a coaling station, fuel oil tanks, hospital, and water system. Kuahua Island had been obtained by condemnation in 1902 under a $150,000 appropriation. Work on Kuahua Island was begun on March 13, 1903. That year, grading work for the railroad on the island, which was to service the magazine buildings and wharf, was started.[7] Although the monetary appropriation for what would become the Naval Ammunition Depot (NAD) at Kuahua was obtained in 1908, it wasn't until 1913 that construction on five magazines and a concrete wharf was begun.[8] Eight magazines (Facilities 416-423), the railroad system, and presumably the wharf were competed on Kuahua in 1915. As of 1916 the island was also the temporary home of the submarine base, which was moved to Quarry Point in 1919.

Development of the Naval Ammunition Depot at Kuhaua during World War I

"The growth of the Navy in materiel [sic] and in personnel during 1917 and 1918 was phenomenal…in 1917 the shore establishment was inadequate for the demands then thrown upon it."[9]

At the opening of World War I in Europe, the Navy conducted a survey of its fleet, shore operations, and merchant marine and concluded that great improvements were needed to all in the event that the US was to enter the war. A three-year program for expansion was implemented in 1916. When the nation entered the war in April 1917 the program had only just begun, but the Navy was able to make good progress and mobilize fairly quickly. Most of the improvements during this period were to facilities on the east coast of the United States, but Pearl Harbor was also included. During the war, work (either financed from the pre-war three-year program or from earlier appropriations) was done on the dry dock, marine railway, oil storage plant, radio station, and Kuahua NAD.

Facility 425 was built in 1917.[10] Original plans for Facility 425 are dated March 16, 1917.[11] They were produced by the Bureau of Yards & Docks, Department of the Navy, and are signed by Admiral F. R. Harris, who was the Chief of the Bureau from January 14, 1916 until January 12, 1918. Historic photos show the building under construction, with exterior scaffolding still in place, in early September 1917 and complete on October 3, 1917.[12] Facility 425 was named "Magazine for Explosives D."[13] It was originally used for stockpiling an explosive compound called explosive D (also referred to as Dunnite) which was an important component in armor-piercing shells.

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[7] "History of Pearl Harbor," *Honolulu Star Bulletin*, April 8, 1938, Service Section, Fleet Edition, 13.
[8] Ibid.
[9] Department of the Navy, *Activities of the Bureau of Yards and Docks, Navy Department, World War 1917-1918*, (Washington D.C.: Government Printing Office, 1921), 17.
[10] PWC Pearl Harbor, *Historic Resources Inventory Form for Bldg 425*, (Pearl Harbor: Navy Public Works Center, February 9, 1984)
[11] National Archives and Records Administration (NARA), drawing, *Location Plan & Magazine Plans and Elevations*, RG71-1402-32-14, March 16, 1917.
[12] NARA, photograph 1506 in 71-CA-157J-13, September 3, 1917, and photograph 1551 in 71-CA-157J-14, October 3, 1917.
[13] NARA, *Location Plan*, RG71-1402-32-14, March 16, 1917.

Facility 425 was part of a construction phase on Kuahua Island which also included an Explosive D Filling House (Facility 426), and a Surveillance Test House (Facility 424).[14] At the time of Facility 425's construction, the Naval Ammunition Depot at Kuahua Island consisted of sixteen buildings; Gunner's Quarters (Fac 401 & 402), Marine Guard Bldg (Fac 409), Shipping House (Fac 411), Power & Locomotive House (Fac 412), Torpedo & Mine Bldg (Fac 413), Primer House (Fac 414), Magazine Bldgs (Fac 415, 416 & 417), Fixed Ammunition Bldg (Fac 418), Loaded Shell House (Fac 419), Segregation Bldg (Fac 420), High Explosives Bldg (Fac 421), and Filling Houses (Fac 422 & 423).

Seven of the buildings that existed in 1917 were constructed under a 1913 contract (Contract No. 2002, dated October 21, 1913) that was let to the Lord Young Engineering Company of Honolulu.[15] The buildings were completed by October 17, 1914, they included two Magazine Storehouse Buildings (Fac. 416 [called Magazine No. 2] & 417 [called Magazine No. 3]), Shipping House (Fac. 411), Torpedo & Mine Bldg (Fac. 413), two Filling Houses (Fac. 422 & 423), Segregation House (Fac. 420). At least two of the buildings which were extant in 1917 have construction dates of 1914 and were completed before the above seven, under Contract No. 1903; Fac. 414 Primer House, completed in June 1914,[16] and Fac. 418 Fixed Ammunition House, completed in July 1914.[17]

The stucco finished terra cotta tile construction employed for Facility 425 was also used on a number of these other buildings that were built around the same time. Facility 414, 416, 417, and 418 were all built in this way, typical construction for most high explosive magazines during the period. Facility 426, the Filling House built in conjunction with Facility 425, was built with corrugated siding (presumably cement asbestos) and a wood-framed roof.[18] An earlier Filling House, Facility 423 (referred to as filling house No. 2) built in 1914, appears constructed with a stucco finish, probably over the then standard terra cotta hollow tile.[19] This filling house and its neighbor, Facility 422, Filling House No. 1, were both constructed with roofing shingles laid in the diamond patterned French Method.[20]

A later building at NAD Kuahua, Facility 442 (Small Arms Ammunition Storehouse, built in 1923 and approx. 30' x 50'), was constructed of corrugated metal. This was a standard warehouse construction method, an accepted building form for small arms ammunition storage, which is much more stable and not prone to mass detonation like high explosives.

Facility 425 was serviced, via the loading platform on its east side, from a short spur of railroad track which extended off the main line of the Kuahua Island rail system, passing just to the southeast of Facility 425. This railway system connected the shipping house and wharf at the western point of the island with the storehouses, filling houses, primer house, and torpedo and mine building at various locations on Kuahua. Upon the completion of the rail system, it

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[14] Ibid.
[15] NARA, *Seven Magazine Buildings U.S. Naval Station, Pearl Harbor, T.H.*, document in photo collection RG71-CR vol. 5 box 3 of 3, October 1914.
[16] NARA, photograph 435 in RG71-CA box 155 folder Y, "Primer House," June 1914.
[17] NARA, photograph 473 & 474 in RG71-CA box 155 folder S "Primer House," July 1914.
[18] NARA, photograph No. 1552 in RG-71-CA-157P. October 3, 1917.
[19] NARA, photograph 541 in RG71-CA-157P,October 1914.
[20] Ibid. and NARA, photograph 13612 in RG71-CA-157P.March 23, 1925.

operated only on Kuahua Island and was not connected to mainland Oahu, but by 1919 a rail line was run along the causeway at the east end of Kuahua to the mainland. This line ran around the southeast side of Pearl Harbor and connected Kuahua to the sub base and the rest of the Navy yard. A vehicular road was also built along the causeway.

Ammunition magazines during World War I

"Until a major disaster at an ammunition depot in 1926, very little was written on the design and construction of ammunition magazines as a building type."[21]

During World War I the navy utilized two categories of ammunition depots; major ammunition depots and minor ammunition depots. Major ammunition depots contained facilities to transform raw materials into finished, loaded and assembled ammunition. Kuahua was this type of ammunition depot, and the only major ammunition depot outside the continental United States. The others were located at Hingham, MA; Iona Island, NY; Fort Mifflin, PA; St. Juliens Creek, VA; Puget Sound WA; and Mare Island CA. Minor ammunition depots, the second category, had storage for bulk materials and assembled ammunition. These were located at New London, CN; Fort Lafayette, NY; Lake Denmark, NJ, Charleston, SC; Olongapo, Philippines, and Cavite, Philippines.

Before and during WWI there were three types of ammunition and explosive storage facilities used by the U.S. military; the open dump (principally used only in wartime), which was an open storage area for stacking ammunition, the casemated magazine (used only at coastal artillery sites), which was a protected masonry structure often set into a hill, and the aboveground magazine with floors at grade or raised to the level of a rail road car. Facility 425 was of this last type.

At the time of Facility 425's construction, the Navy was utilizing a standard-designed building for the storage of powder, shells, and fixed ammunition.[22] Along with these buildings, the Navy utilized non-standard designs for "buildings constructed to fulfill local conditions and purposes peculiar to one station."[23]

> Magazine design never had a centralized clearing-house for the issuance of standardized plans for construction prior to the World War II mobilization. The selection of plan type and the details of construction were historically left to the individual installation commander, resulting in an ever-widening variety of deviations and specialty magazines…Design changes and lessons learned were not centrally shared, which thus hinders tracing a linear evolution of the design.[24]

For magazine buildings, there is much similarity between Navy construction and Army Quartermaster standard construction and plans. This is evidenced by comparing the original plans for Facility 425 and the Navy's standard plans for magazine buildings with Army

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[21] Joseph Murphey, Dwight Packer, Cynthia Savage, Duane E. Peter, Marsha Prior, *Army Ammunition and Explosives Storage in the United States: 1775-1945,* (Forth Worth: U.S. Army Corps of Engineers, July 2000), 5.
[22] NARA, drawing Y&D 75824 *Standard Magazine Building, Naval Ammunition Depots, Plans , Elevations & Sections*, in RG71-reel B7, May 15, 1918.
[23] Department of the Navy, *Activities of the Bureau,* 280.
[24] Murphey, et al, *Army Ammunition,* 5-6.

Quartermaster-planned magazines of the 1930s.[25] These similarities included gabled asbestos-protected roof, roof ventilators, hollow tile construction covered with stucco, concrete floors, and a full length loading platform.

Although the standard Navy magazine building was a larger structure than Facility 425, having a width of 50', an interior height (floor to underside of roof framing) of 14', and varying length of up to 250',[26] many of the standard building's design and construction features were duplicated in Facility 425. Design requirements for the standard buildings seen in Facility 425's design are; ease of handling of material, protection from high temperatures, spark resistant floor construction, and induction ventilators on the roof. For the standard buildings, and also seen in Facility 425's construction, these requirements were achieved using terra cotta tile walls with exterior stucco, asbestos shingle roofing, steel doors, and full length loading platform served by a railroad track. Spark resistant floor construction was typically one of two types on the concrete slab in the standard building; asphalt mastic, or blind nailed maple flooring on sleepers. Facility 425's floor was a variation of the second type; it was originally wood flooring on wood sleepers with a cinder concrete fill in the voids between sleepers.[27] The buildings were built with hollow terra-cotta tile masonry and asbestos shingle roofing to provide a fireproof exterior and a relatively lightweight construction of the walls and roof. The theory behind this was that if the magazine building exploded no large chunks of wall and roof debris would be ejected to any great distance.[28]

Another feature of the standard building constructed in "situations having climactic conditions equivalent to those which exist on the Atlantic coast south of Hampton Roads" was a ceiling at the bottom of the roof trusses which had vents into the air space between ceiling and roof.[29] This had the effect of significantly lowering the internal temperature of the magazine buildings, and was a feature utilized in Facility 425's construction, the ceiling vents here covered by the japanned metal grates.

Lightning was a constant threat to magazine buildings, and each one built had a lightning protection system installed to minimize the risk of lightning-induced fire or detonation (ibid.). The original lightning protection system at Facility 425 was of somewhat detailed construction, following standard Navy plans[30] and also probably typical for locally designed magazine buildings during the WW I period. It consisted of a 2'-6" high lightning rod with a 6" high wrought iron point fixed at its top. One of these lightning rods was placed on top of each round induction ventilator on the roof. A 3/8" diameter copper cable was fixed to the base of each rod. This cable ran along the length of the ridge of the building, supported between the main rods at the ventilators by small, 4 1/2" high cast brass fasteners with supplementary points that were each mounted on a wood block that straddled the ridge. At the gable ends the cable was routed down the ends of the building into the ground where the strands were separated, splayed out,

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[25] U.S. Army Corps of Engineers Seattle District, *Context Study of the United States Quartermaster General Standardized Plans 1866-1942*, (Seattle: U.S. Army Corps of Engineers, November 1997), 181-183.
[26] Department of the Navy, *Activities of the Bureau,* 281.
[27] NARA, *Location Plan*, RG71-1402-32-14, March 16, 1917.
[28] Murphey, et al, *Army Ammunition,* 21.
[29] Department of the Navy, *Activities of the Bureau,* 281.
[30] NARA, drawing Y&D 68798, *Naval Ammunition Depot Standard Mine Storage Bldg, Floor Plan, Elevations, Sections & Details* in RG-71-reel B7, May 2, 1917.

and fixed to seven 6" x 34" copper plates that were 0.0403" thick. The plates were evenly spaced in a radial orientation, set vertically on edge underground with their bottom edges 4'-0" below grade. The trench they were laid in was filled with coke.[31]

For the design and construction of different magazines during WW I the military used six different classes, one for each varying type of ammunition and components, based on the volatility and explosive potential of the material stored. Each class had its own specifications for the aboveground magazine.

> Class one: Finished ammunition and loaded components. These were stored in standard constructed magazines, typically about 20' x 50' and spaced 300' - 400' apart. This class of ammunition has a moderate level of sensitivity (the likelihood of a mass detonation of shells larger than 6" diameter is low) but can be extremely heavy, so concrete floors needed to be rated at 1,000 pounds per square foot.
>
> Class two: Smokeless powder. This class of ammunition is not explosive unless it is contained; it is however easily ignited and burns intensely. Aboveground magazines for this class were built with fireproof exteriors of asbestos siding. They were typically about 32' x 96' with a 300' spacing to minimize the chances of fire spreading from one to another.
>
> Class three: Fuses and primers. This class of ammunition is extremely sensitive and very expensive to produce. These were also stored in 32' x 96' magazines spaced 300' with exteriors that were impervious to sparks. Destruction of a small amount of fuses and primers would render a much larger volume of other components unusable.
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> Class four: High explosives. This class of ammunition was very susceptible to mass detonation, ensuring that the entire quantity of material stored in one magazine building would be destroyed if initiated. This meant storing high explosives in smaller volume magazines which were standard construction of hollow tile to prevent ejected heavy debris from threatening nearby magazines. Typically this class was kept in magazines measuring about 26' x 42' and spaced 800' apart.
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> Class five: Sodium nitrate and inert components. These components are very stable and do not require a specialized magazine. Sodium nitrate is not explosive, merely an oxidizing compound that needs to be combined with a combustible substance in order to burn.
>
> Class six: Small arms ammunition. This type of ammunition is also very stable, and does not call for a specialized magazine. Standard warehouse facilities with added brick firewalls which sectioned off the spaces into 100' x 160' areas were used.[32]

Facility 425 was designed to store class four: high explosives. It was designated as a magazine for a compound known as explosive D, a high explosive that was packed into armor piercing shells during WWI. Facility 425 shows the typical characteristics of an aboveground magazine designed for this type of ammunition; it has a fire proof roof of asbestos shingles, is lightning protected, the floor is level with the rail cars that serviced it, and it is terra cotta tile construction.

Explosive D

Explosive D is another name for the compound ammonium picrate, which was additionally known as Dunnite before and during WW I. This explosive compound was first developed in the mid 1800s and later employed in some of Alfred Nobel's patented mixtures for use in dynamites.

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[31] NARA, *Location Plan*, RG71-1402-32-14, March 16, 1917.
[32] Murphey, et al, *Army Ammunition,* 20-22.

Ammonium picrate was adopted as an explosive by the U.S. Army in 1901 and by the U.S. Navy in 1907. The name Dunnite is after U.S. Army Ordnance Corps Colonel B.W. Dunn, who was important in its adoption by the Army. Explosive D was valuable to the military during the early years of the 1900s because it is a high explosive that is relatively insensitive to friction and shock. It was important as an explosive used in armor piercing shells because it did not detonate when the shell it was packed into was fired and came in contact with heavy armor. Earlier compounds would detonate as the shell hit, resulting in an explosion on the face of the armor and leaving little damage. A shell packed with Explosive D was insensitive to this initial shock of impact, allowing the heavy shell to slice through the armor before the Explosive D was detonated, bursting inside the armored compartment with devastating results. This explosive was seen as a great breakthrough in 1907,[33] but by 1911 its use was discontinued by the Army, being replaced by newer compounds.[34] Its use was continued by the Navy in armor piercing shells.

1926 Lake Denmark explosion

The standard design of hollow terra cotta tile construction for Navy magazine buildings survived well into the 1920s. Some standard-plan terra cotta tile magazine buildings were still being constructed by the Army as late as 1934.[35] The event that began the switch from standard terra cotta construction was an explosion that occurred on July 10, 1926 when lightning struck a 150' x 200' terra cotta constructed ammunition storage building (Magazine Number 8) at the Naval Ammunition Depot at Lake Denmark NJ. A fire erupted and within minutes the building exploded, leaving a crater and sending burning debris over a mile, resulting in two more horrific explosions at Magazine Number 9 and Shell House Number 22. The blasts resulted in the destruction of structures within a radius of 2,700'. Buildings were damaged out to a radius of 8,700' (1.65 miles) from the blasts. Nineteen people were killed.[36]

A Navy court of inquiry and a Joint Army-Navy Board on Ammunition (JBA) were convened to look into the disaster. One JBA recommendation was the creation of a permanent joint board to advise the Secretary of War and the Secretary of the Navy. This became the Joint Army-Navy Munitions Board (JANMB), established August 6, 1928, which would oversee explosives at military installations[37].

One recommendation of the JBA was to establish a table of safe distances from explosives storage facilities. Before 1910 there were no standards established for safe distances from explosives and ammunition storage areas, and large quantities of these materials were often stored near population centers. In 1910 a group of explosives industry representatives, the Institute of Makers of Explosives (IME) formulated the American Table of Distances (ATD), a

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[33] "Dunnite Smashes Strongest Armor," *New York Times,* August 18, 1907.
[34] "Ridicule Spy Story," *New York Times,* August 8, 1911.
[35] U.S. Army Corps, *Context Study*, 183.
[36] Murphey, et al, *Army Ammunition,* 22.
[37] This board would be renamed numerous times in the ensuing decades:
The Joint Army and Navy Board on Ammunition Storage on August 20, 1930 (JANB[on]AS)
The Joint Army and Navy Board of Ammunition Storage on January 22, 1942 (JANB[of]AS)
The Joint Army Navy Ammunition Storage Board on March 24, 1943 (JANASB)
The Army Navy Explosives Safety Board on May 2, 1945 (ANESB)
The Armed Services Explosives Safety Board on September 16, 1948 (ASESB)
The Department of Defense Explosives Safety Board on October 23, 1971 (DDESB)

guide to calculating safe distances between explosive storage sites and their surroundings in order to minimize property damage in the event of an explosion. The ATD was developed by examining the results of over 100 previous explosions of storage sites. When the ATD was established, a number of states, including New Jersey, codified it into state law. The ATD was not adopted by the military at this time. After the 1926 Lake Denmark explosion the JBA recommended that, the military adopt New Jersey's explosives regulations, which used the ATD as its safety guidelines. This was done, and until the middle of WW II explosives safety standards in the military closely followed the ATD. By the early 1940s, in view of advancements in military explosives, it was recognized that the early accident data the ATD was based on was quite limited. Information from subsequent testing and also data from accidents which occurred after 1910, notably the 1944 Port Chicago Naval Magazine (California) explosion were incorporated into a new version of the safety standards. These were adopted on February 1, 1955 and came to be known as the Explosive Safety Quantity Distance (ESQD) standards.

The most visible improvement in high explosive storage to result from the study of the Lake Denmark explosion was the development of a new type of standard magazine building. This was an underground structure, (typically concrete, but also built of arched sections of steel) banked with earth and commonly called the igloo magazine. Although the Navy had utilized flat-roofed earth-covered magazines as early as 1918, the standardized igloo offered the advantage of its thick earth-banked sides and relatively thin top surface channeling any explosion straight upward and reducing the radius of subsequent detonations. The earth covering also moderated temperature extremes and protected the magazine contents from detonation by debris from an adjacent explosion. The Navy began building igloo magazines in 1928, and they became the model for virtually all future ammunition storage facilities for all branches of the military.

In April 1934 the Naval Ammunition Depot at Kuahua was decommissioned and its duties were taken up by the newly formed Naval Ammunition Depot Oahu, located on the west side of Oahu in Lualualei Valley. Kuahua was no longer suited as an NAD site because of its central location and unexpandable configuration in Pearl Harbor. This decision to relocate the NAD from Kuahua Island seems to have been prompted by the need for more explosive and ammunition storage facilities in anticipation of an upcoming conflict, not by any significant increase in the ATD safety arc which might have imposed new safety distances on the existing facilities on the island. "Significant changes have been made to these [explosive safety] standards in 1950, 1955, and during the 1970s."[38]

With the transfer of the NAD from Kuahua, the island saw little expansion until about 1940 when Navy efforts began to transform it in to a fleet supply base. The island was converted to a peninsula by filling a large area at the causeway between the east end of the island and mainland Oahu. Six of the pre-1930 steel truss-roofed ammunition magazine buildings on Kuahua were converted to warehouses.[39] From at least 1983 to 1997, Facility 425 was used as a storage building for hazardous/ flammable materials. The building appears to have been used as an exercise room after that.

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[38] David Freund, *Origin and Subsequent Modifications of Explosive Safety Quantity Distance (ESQD) Standards for Mass Detonating Explosives with Special reference to Naval Vessels, Vol. I*, (Bethesda MD: David W. Taylor Naval Ship Research and Development Center, 1978), 19.

[39] Ann Yoklavich, *HABS No. HI-388, U.S. Naval Base Pearl Harbor Warehouses,* (Pearl Harbor, HI, 2005), 7.

PART III. SOURCES OF INFORMATION

A. Architectural Drawings:

A historic drawing dated March 16, 1917 showing the location, plan, and elevation of Facility 425 is located at National Archives and Records Administration, RG-71-1402-32-14.

B. Early Views:

Photos of Facility 425 are located at National Archives and Records Administration, RG-71-CA 157H, 157J, &157S. A 1934 aerial view of Kuahua Island showing Facility 425 is located at Bishop Museum Archives, Honolulu, Hawaii; Album 1986.367.04 p.51. These photos in the NARA collection were created by a government agency, the U.S. Navy Bureau of Yards & Docks, and are considered in the public domain.

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_____. Photo No. 473 & 474 in RG 71 CA Box 155, Folder S "Fixed Ammo House." July 1914

_____. Seven Magazine Buildings U.S. Naval Station, Pearl Harbor, T.H. Document in photo collection RG 71 CR Vol. 5, box 3 of 3. October 1914.

_____. Photo No. 541 in RG-71-CA-157P. October 1914.

_____. Drawing Y&D 68798 *Naval Ammunition Depot Standard Mine Storage Bldg, Floor Plan, Elevations, Sections & Details* in RG-71-reel B7. May 2, 1917.

_____. Photo No. 1506 "Magazine Building" in RG-71-CA-157J. September 3, 1917.

_____. Photo No. 1551 "Magazine Building" in RG-71-CA-157J. October 3, 1917.

_____. Photo No. 1552 "Filling House" in RG-71-CA-157P. October 3, 1917.

_____. Drawing Y&D 75824 *Standard Magazine Building Naval Ammunition Depots, Plans Elevations & Sections* in RG-71 reel B7. May 15, 1918.

_____. Map of Yard, U.S. Naval Station Pearl Harbor, T.H. RG-71-1400-3-540. June 30,1919.

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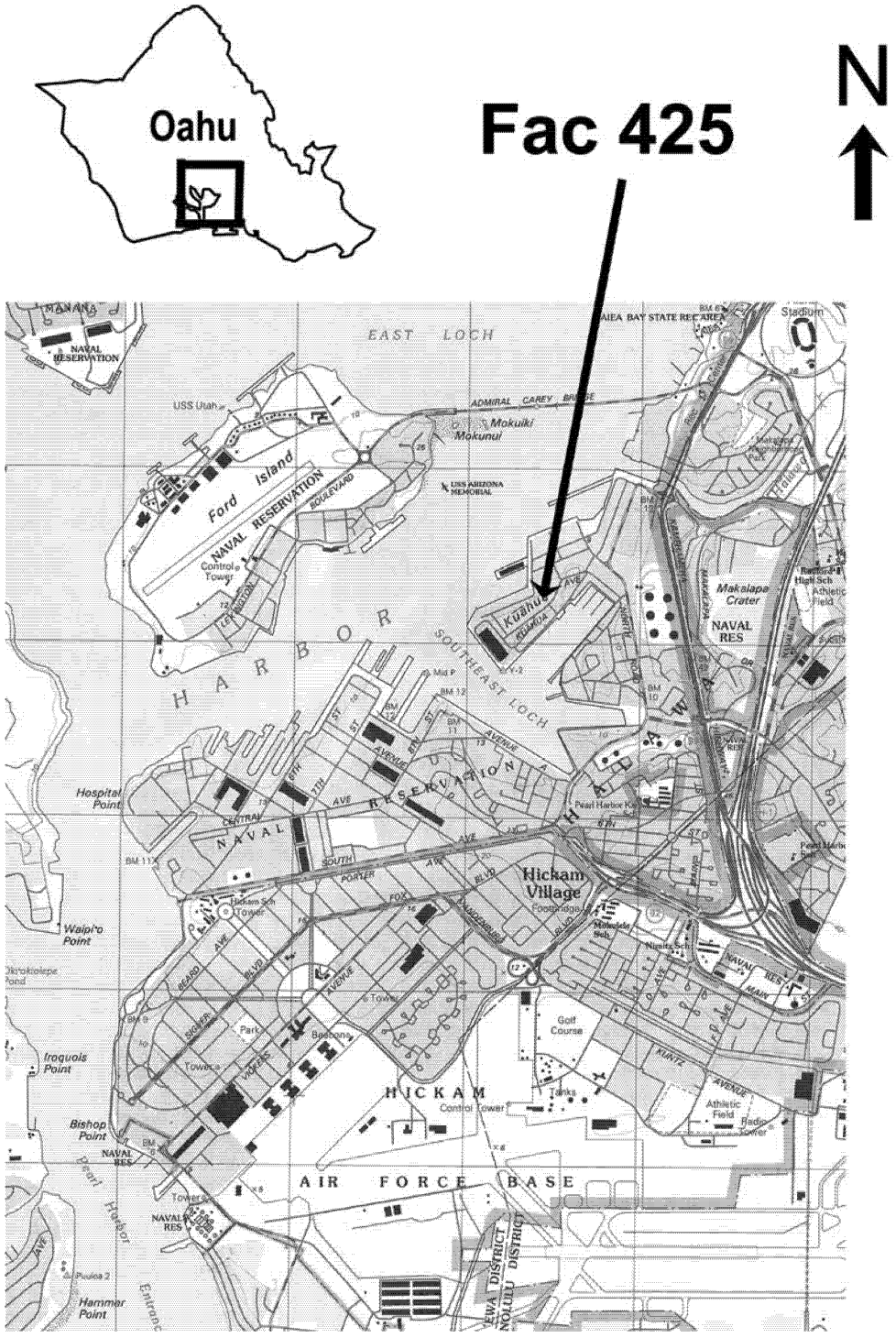
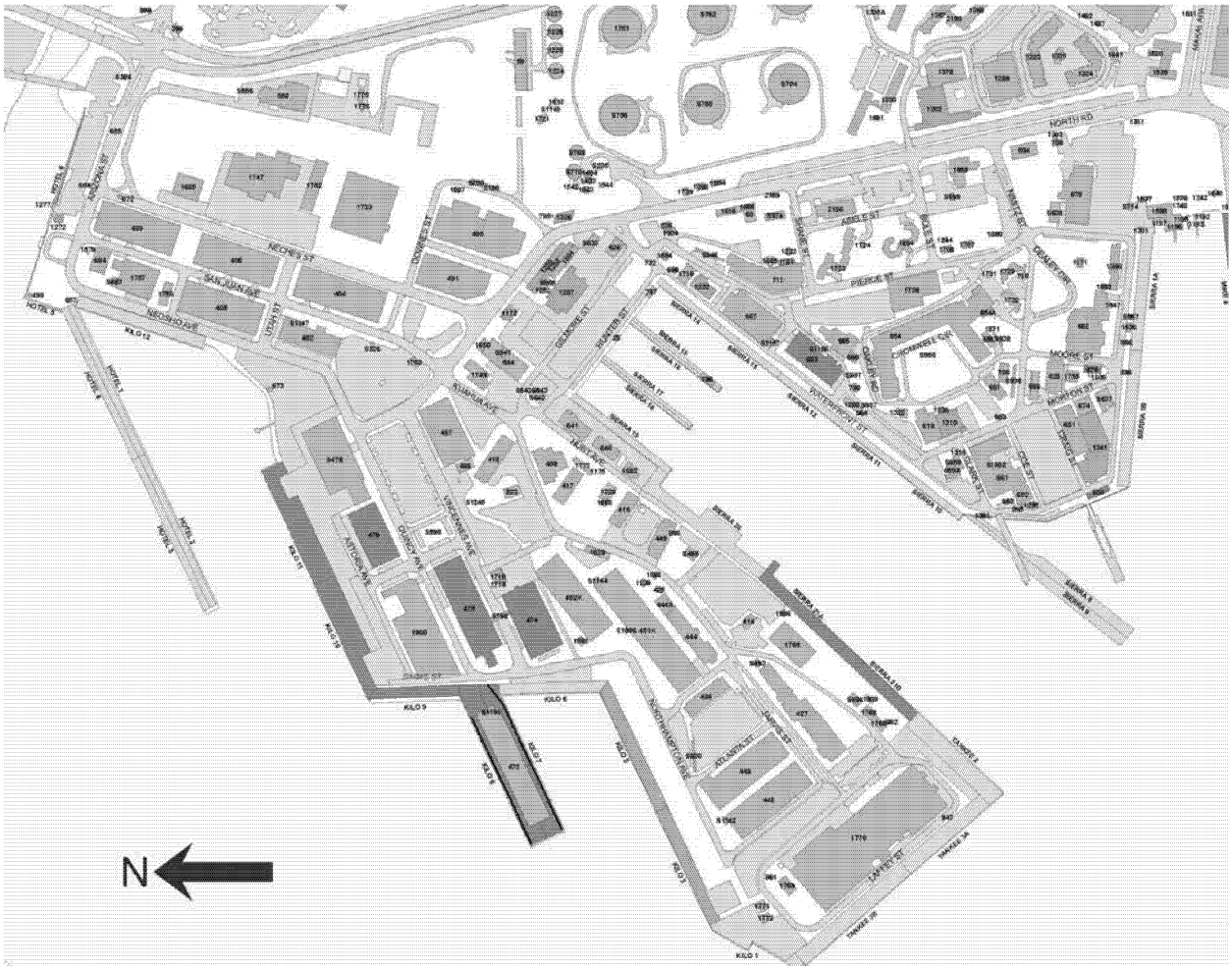
PART IV. PROJECT INFORMATION

This documentation is being undertaken in preparation for the demolition of Facility 425, which provides no functional use to FISC and the Defense Distribution Center Pearl Harbor, which has determined that demolition is the most economically practical option for Building 425. The large-format photographs were taken in December 2007 by David Franzen of Franzen Photography. The report was researched and written by Dee Ruzicka, Architectural Historian at Mason Architects, Inc., Honolulu, Hawaii.

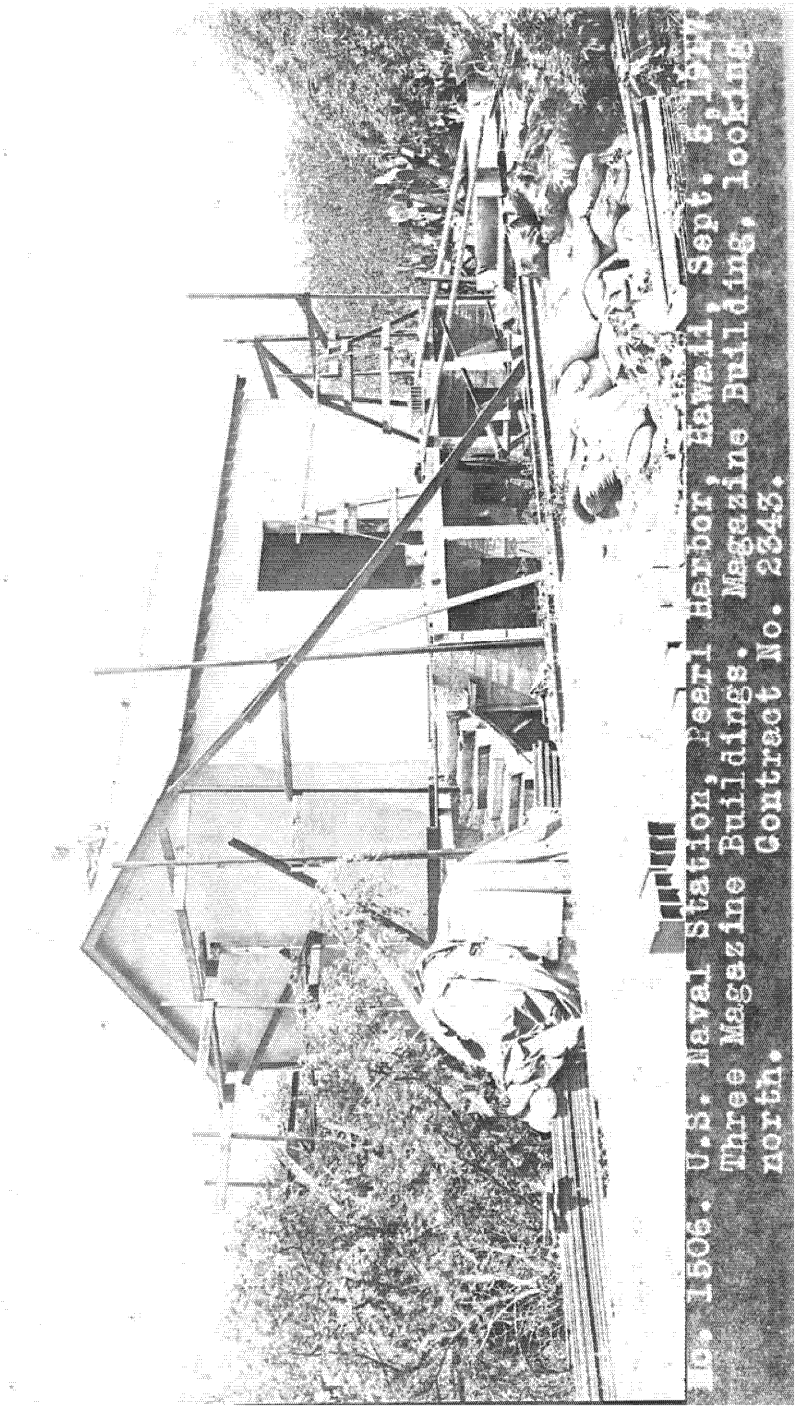
Location map.



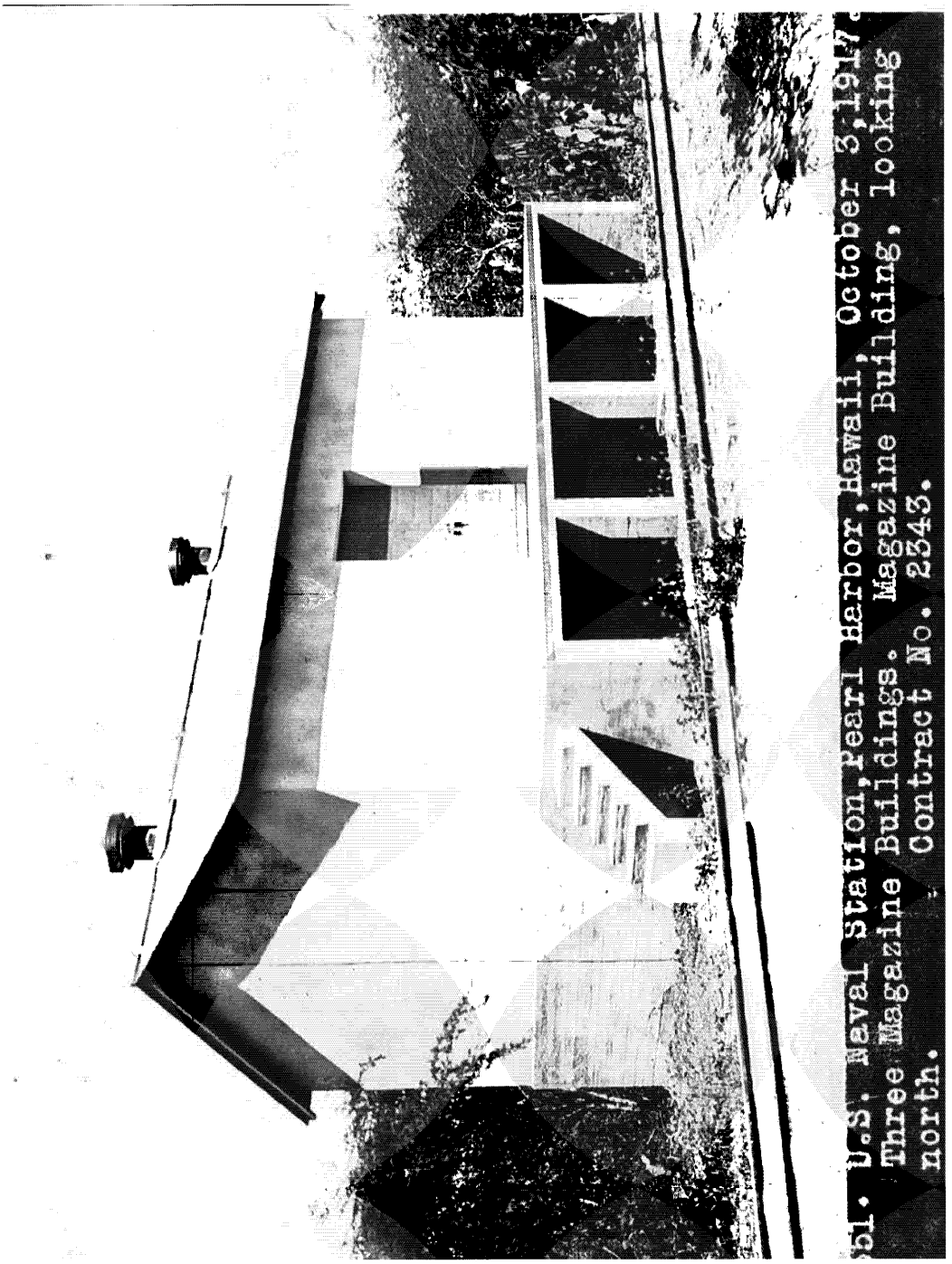
Vicinity map showing existing conditions.



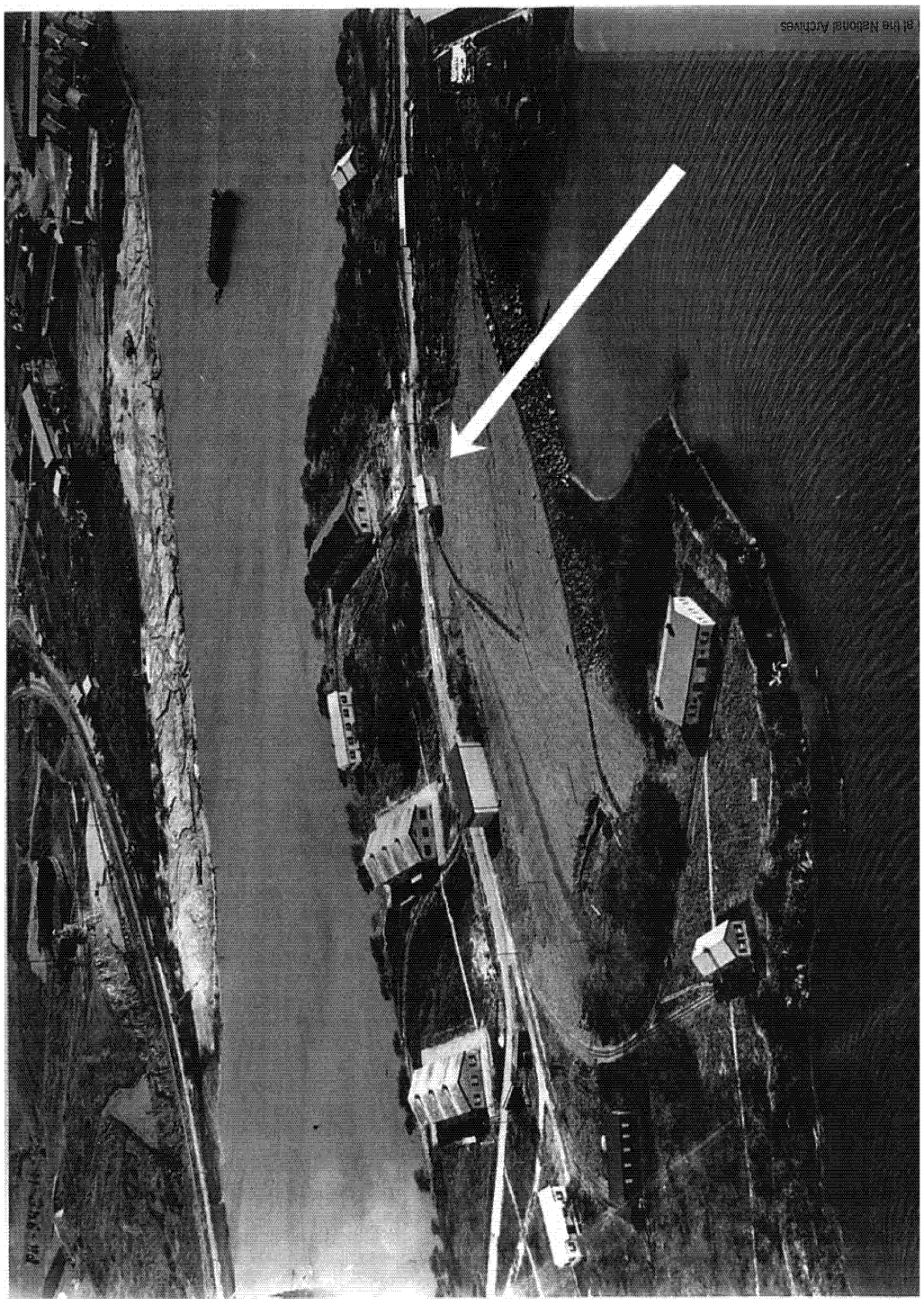
Photograph of Facility 425 dated September 5, 1917 showing the building under construction. NARA 71-CA-157J-13, photo 1506.



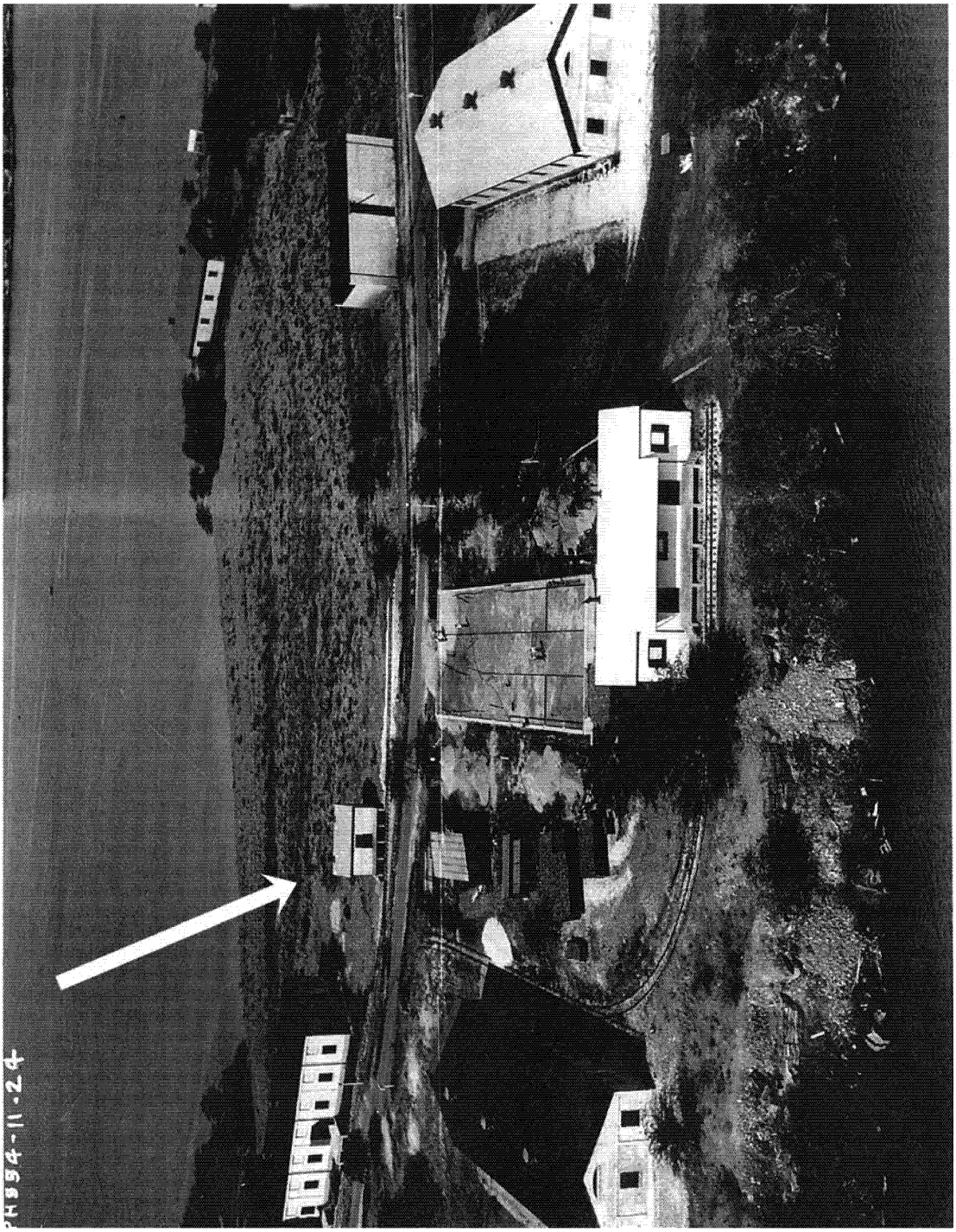
Photograph of Facility 425 dated October 3, 1917 showing the completed building. Note the concrete steps to the loading platform and railroad tracks. NARA 71-CA-157J-14, photo 1551.



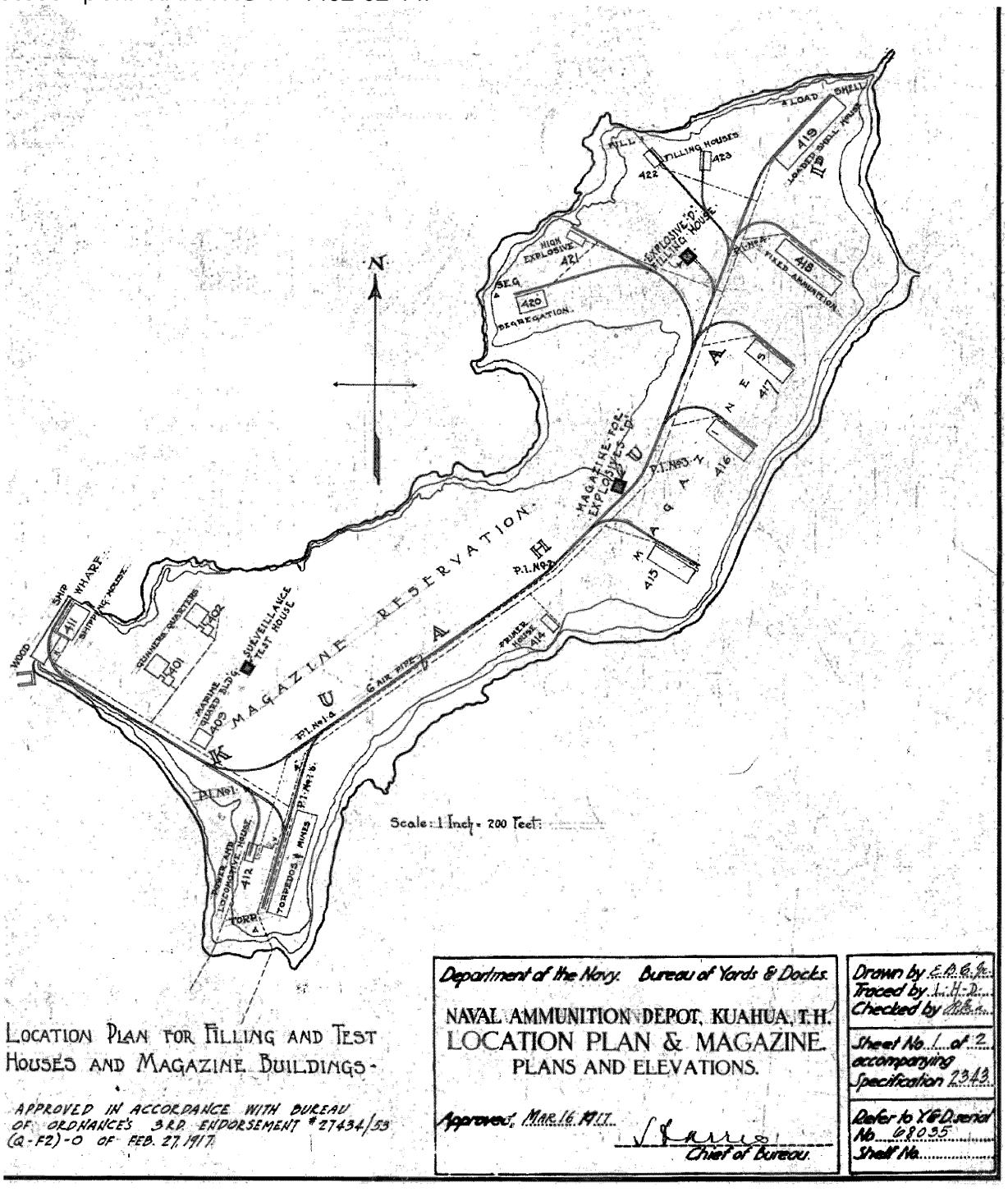
Aerial photograph dated November 27, 1923 showing Facility 425 (added arrow). View facing southeast. NARA 71-CA-157H-13.



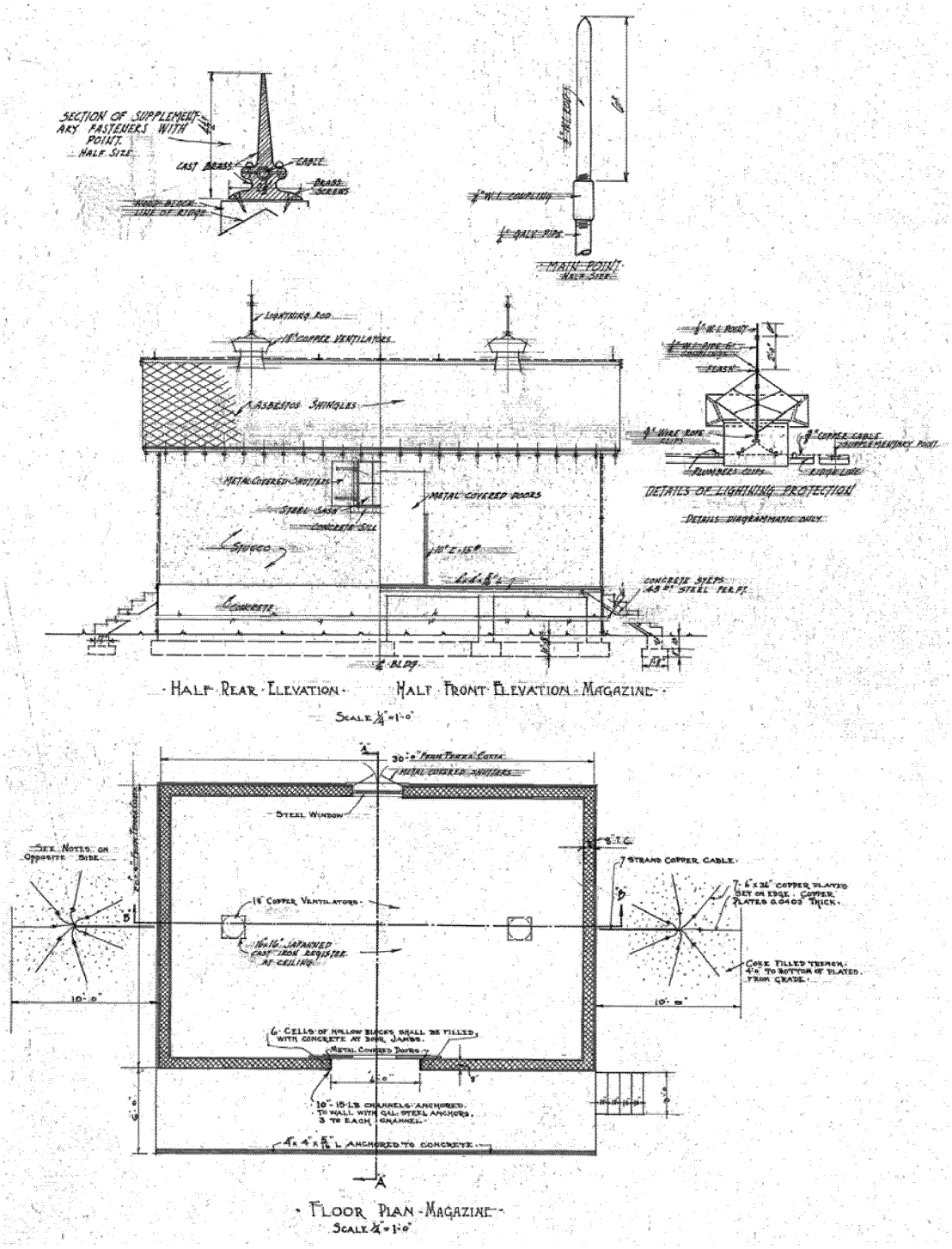
Aerial photograph dated November 18, 1924 showing Facility 425 (added arrow). View facing northwest. Facility 440 (no longer extant) is in the foreground and the foundation of Facility 445 is under construction behind it. NARA 71-CA-157H-12.



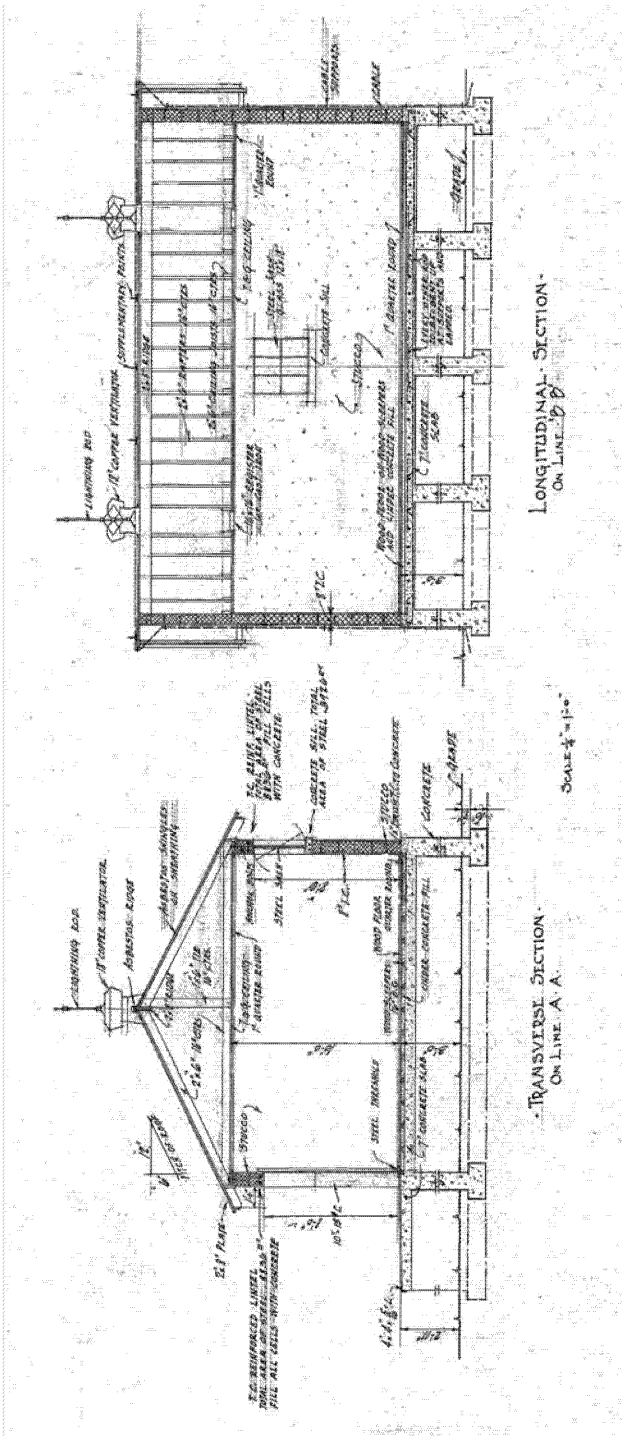
Portion of original drawing for Facility 425 dated March 16, 1917, showing the title block and location plan. NARA RG-71-1402-32-14.



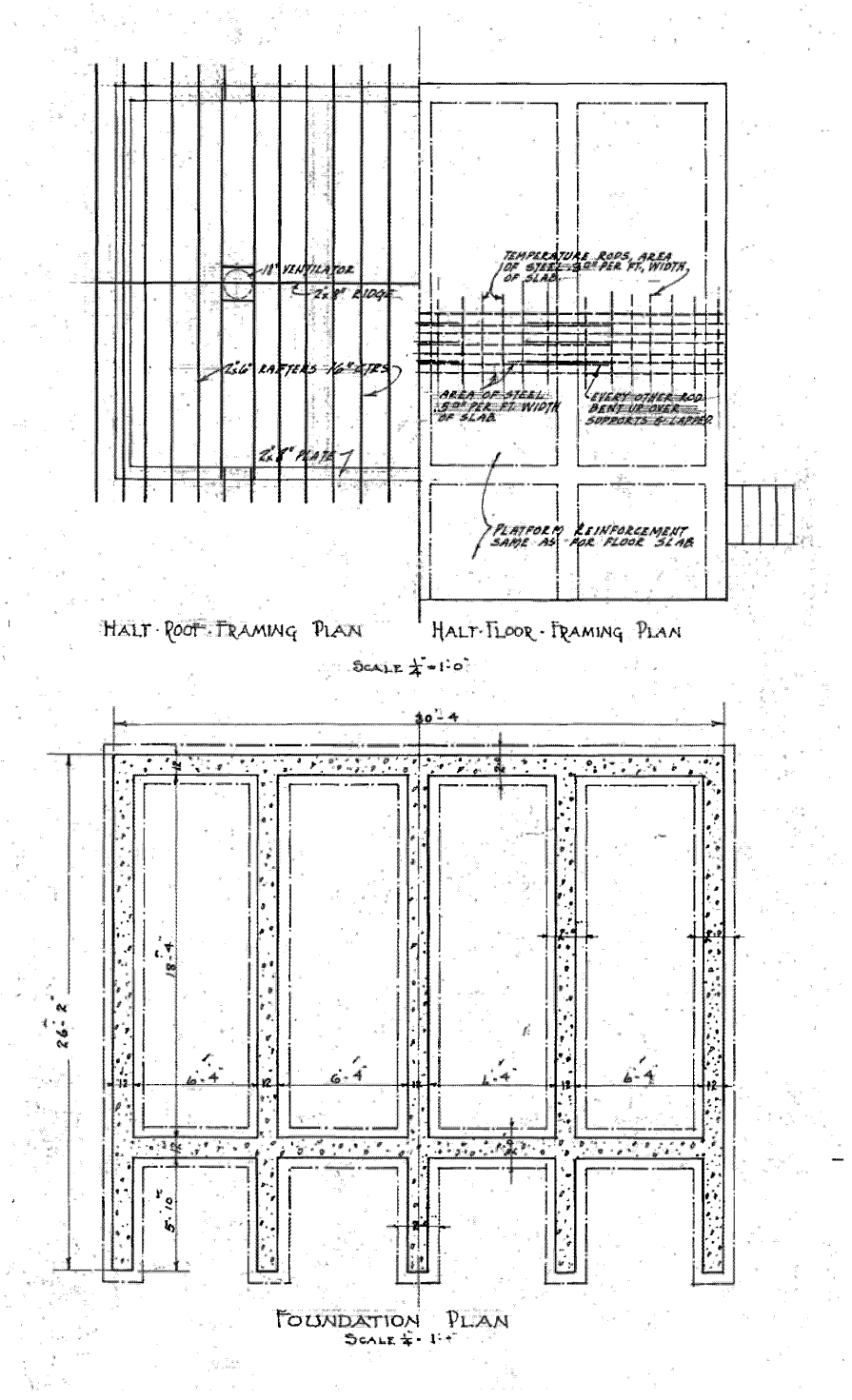
Portion of original drawing for Facility 425 dated March 16, 1917, showing the floor plan, elevations and details of the lightning protection system. NARA RG-71-1402-32-14.



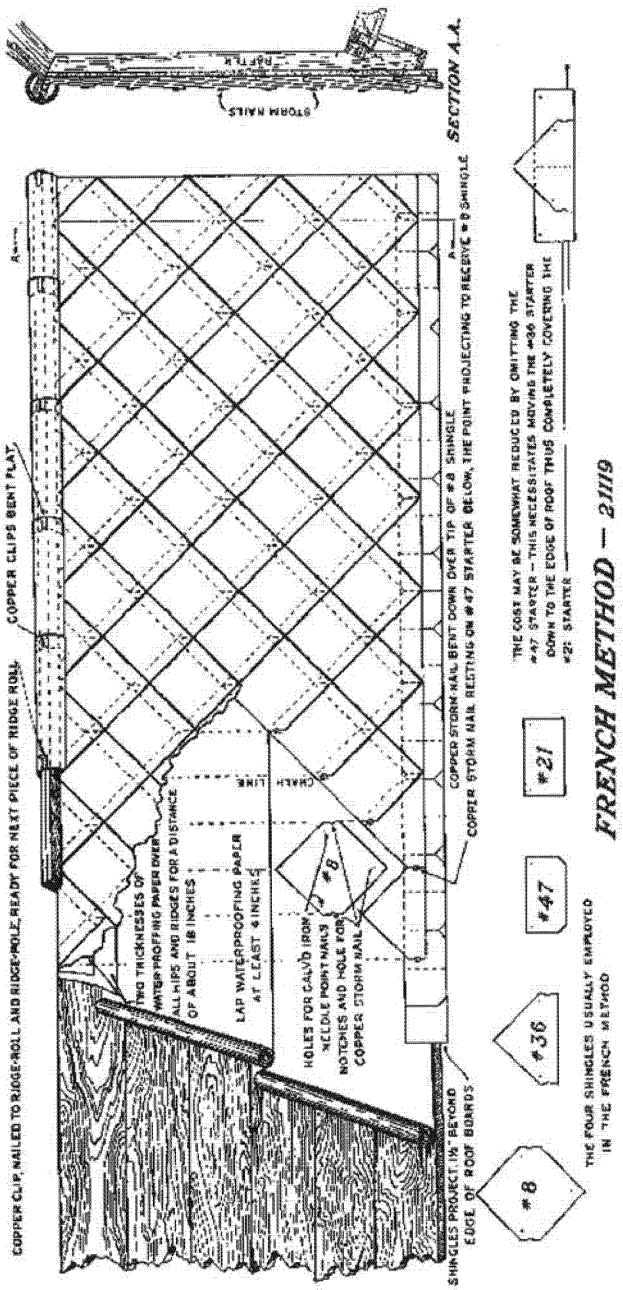
Portion of original drawing for Facility 425 dated March 16, 1917, showing sections of the building. NARA RG-71-1402-32-14.



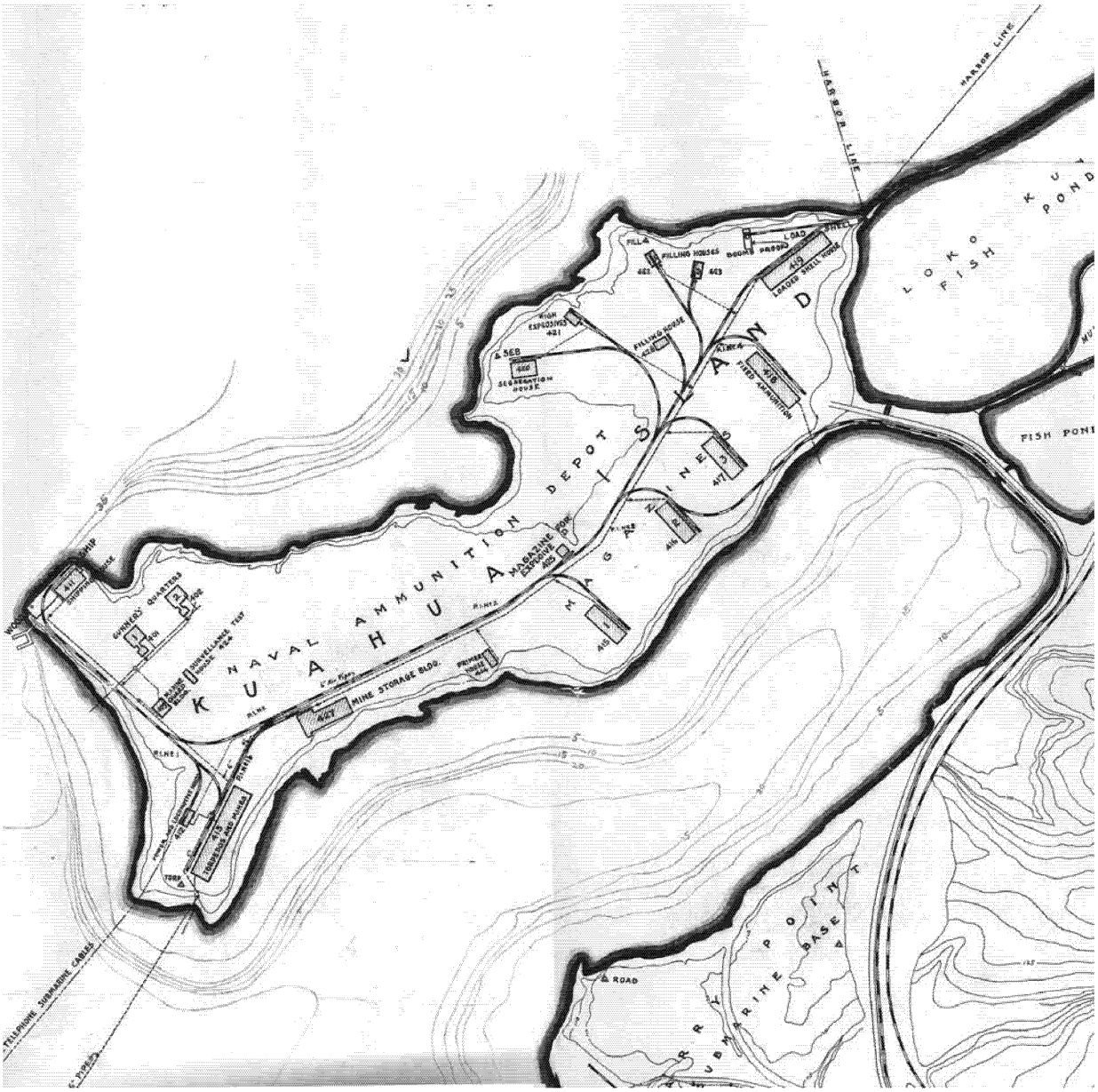
Portion of original drawing for Facility 425 dated March 16, 1917, showing foundation plan and floor and roof framing. NARA RG-71-1402-32-14.



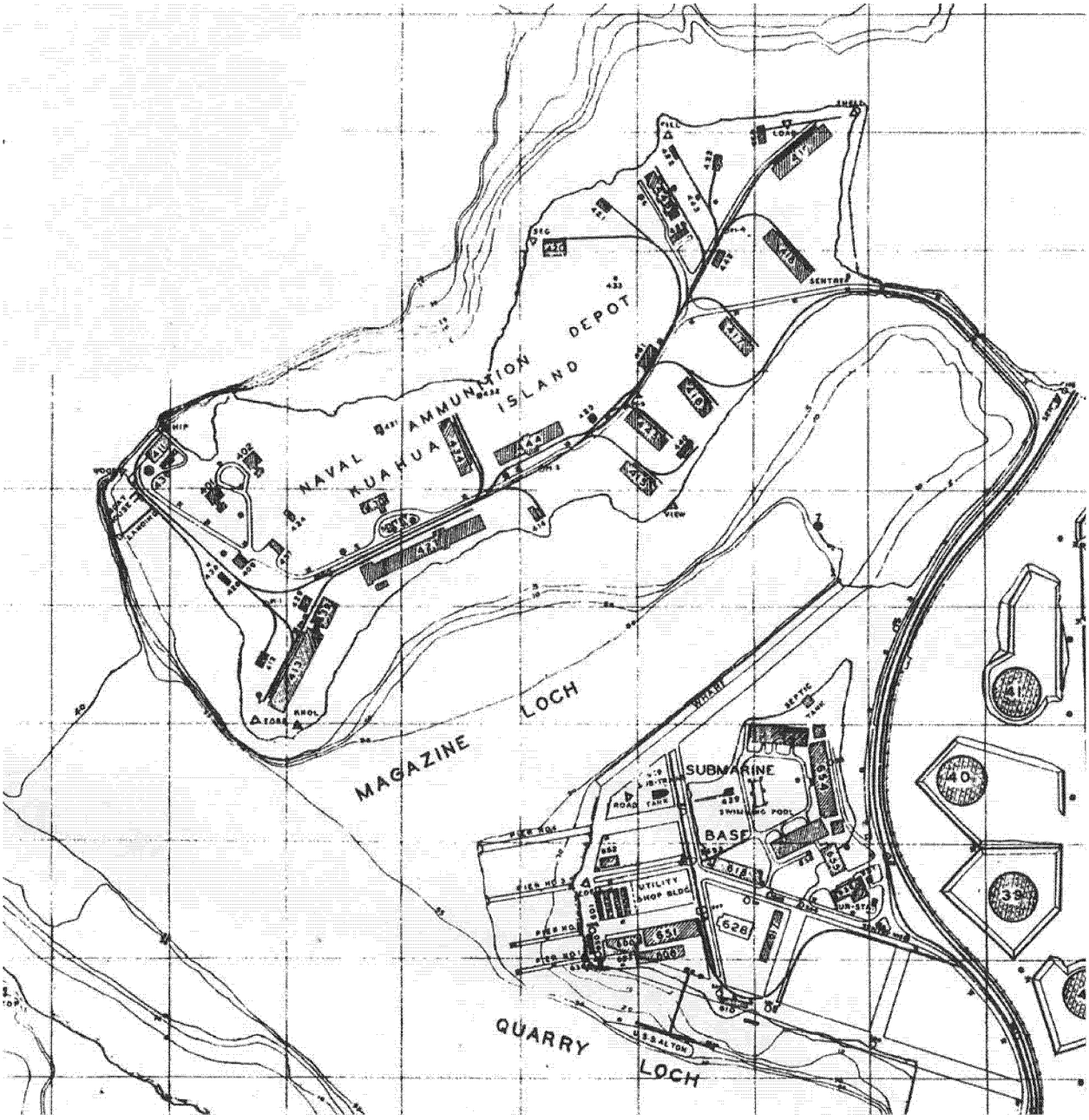
Portion of drawing dated June 3, 1913 showing a configuration for asbestos shingle roofing similar to that found on Facility 425 and termed "French Method." Asbestos Shingle, Slate & Sheathing Company.



Portion of map dated June 1919 showing the Naval Ammunition Depot at Kuahua Island. Note Facility 425 near the center of the island. North at top. NARA RG-71-1400-3-540.



Portion of map dated June 1932 showing development of the Naval Ammunition Depot at Kuahua Island. North at top. NARA RG-71-1400.



Portion of map dated January 1944 showing the transformation of the Naval Ammunition Depot at Kuahua Island into the Naval Supply Depot. Note extensive filling at former causeway. NARA RG-71-1400-3.